POPULATION DENSITY IN METROPOLITAN PHOENIX

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Note: The maps included in this report were produced by the Information Technology Research Support Lab – GIS Services, Arizona State University.

GEOGRAPHIC DEFINITIONS

Metropolitan Phoenix/Phoenix Metropolitan Area: Metro areas consist of one or more counties. The Phoenix metro area consisted only of Maricopa County (which has more than 9,000 square miles) until the results of the 1990 census were tabulated, when Pinal County (which has more than 5,000 square miles) was added to the metro area. Because of this recent addition and since most of the population of Pinal County lives scattered across the county at some distance from Maricopa County, Pinal County has been excluded from Metropolitan Phoenix in this analysis. Since Maricopa County encompasses a substantial land area, most of which is unsettled, countywide data essentially are equivalent to those of the built-up area in Phoenix and surrounding cities. Thus, "Metropolitan Phoenix" may be used to refer to county data or to a more focused look at the developed portion of the metro area.

Phoenix Urbanized Area: Urbanized areas are defined by the U.S. Bureau of the Census, with the boundaries updated every 10 years based on decennial census data. Inclusion in the urbanized area is based on a variety of factors, most notably population density and settlement patterns. The Phoenix urbanized area in 1990 consisted of only 741 square miles, including the extension into Pinal County in the Apache Junction area, compared to some 15,000 square miles in the officially defined metropolitan area. Analyses of population density use the urbanized area definition.

MAG Planning Area: The Maricopa Association of Governments defines an area that already is developed or is expected to be mostly developed by 2020. While its 1,768 square miles are nearly 2.5 times the land area of the 1990 urbanized area, the planning area still is much smaller than the metropolitan area. It includes considerable land currently vacant or used for agriculture, mostly in the southeast corner of the county, to the southwest and west of the developed area, and to the north and northeast. Because of Indian Reservations, the boundaries of the developed area largely are fixed to the south and in part of the east. In the northwest, the planning area does not extend much beyond Sun City West and Sun City Grand.

POPULATION DENSITY IN METROPOLITAN PHOENIX: SUMMARY

Overall population density in the Phoenix urbanized area rose substantially in the 1980s after holding steady in the 1960s and 1970s. It appears that population density continued to increase during the 1990s.

During the 1960s and 1970s, the density of occupied housing units increased. Population density did not rise, however, because of falling average household size (persons per household). During the 1980s, a large advance in the number of occupied housing units per square mile more than offset declining average household size.

The increase in occupied housing density in the 1980s resulted from a combination of factors:

(1) The density of occupied multifamily dwelling units jumped in the 1980s.

(2) The average lot size of single-family houses decreased in the 1980s after holding nearly steady during the 1960s and 1970s.

(3) The land area of the urbanized area rose much less in the 1980s than in the 1970s even though the numeric population increase in the 1980s was slightly greater than in the 1970s.

Thus, much of the housing development in the 1980s consisted of multifamily units built on infill parcels and of single-family housing construction on parcels of land that initially had been skipped over. Many of these infill parcels were at or near the urban fringe. Declining single-family lot size and the small increase during the 1980s in the urbanized land area suggest that population density at the fringe rose.

Compared to all other urbanized areas, the 1990 density in Phoenix was typical. In 1960 it had been unusually low. In each decade from 1960 to 1990, Phoenix was among the urbanized areas posting the greatest increase (or smallest decrease) in population density. However, population density in 1990 in the Phoenix urbanized area remained below the median of large urbanized areas, both nationally and in the West.

Unlike the rest of the Phoenix metropolitan area, population density in central Phoenix dropped during the 1970s and 1980s. The primary cause was a decrease in the number of housing units. Rising vacancy rates contributed, but the increase in vacancy rates was similar to that of the entire metropolitan area. Between 1990 and 1995, population density rose in central Phoenix. A sharp decline in vacancy rates was a major factor in the turnaround, though the vacancy rate decline only matched that of the entire metro area. Another major factor in the increase in density was the rising number of people residing in prisons, homeless shelters, or on the streets.

SPATIAL CHARACTERISTICS OF POPULATION DENSITY

Using the standard measure of population density (population per square mile) for urbanized areas, as defined every 10 years by the Census Bureau, population density in the Phoenix urbanized area held nearly steady during the 1960s and 1970s, then rose substantially during the 1980s.

The population density of the urbanized area, nearly identical in 1960, 1970 and 1980 at about 2,200 residents per square mile, jumped 23 percent between 1980 and 1990, reaching 2,707. The urbanized area consisted of 741 square miles in 1990 – 90 percent more than in 1970, but only 16 percent more than in 1980.

Population density decreases with distance from downtown Phoenix (see Figure 1). In 1970, densities steadily dropped from a high of 5,000 residents per square mile within one mile of the downtown center to less than 2,500 six miles from the center, less than 500 people 12 miles out, and near zero 19 miles from the center.

In 1970, most of the city of Phoenix north of the Salt River and southwest of the Phoenix Mountains, and central portions of Glendale, Scottsdale, Tempe and Mesa, had population densities ranging from average to high. The higher-density areas of Scottsdale and Tempe were beginning to merge and the higher density in the city of Phoenix extended west to downtown Glendale. Otherwise, bands of low density separated these more dense areas from each other.

During the 1970s and 1980s, population density fell within three miles of the center, but rose elsewhere. From 1990 to 1995, densities increased even at the center (see Figure 2). Thus, except within the first three miles, densities in 1995 were considerably higher than in 1970. As in 1970, population density continues to decline with distance from the center of downtown Phoenix. The 1995 density dropped from more than 5,000 per square mile at the center to 2,500 persons 12 miles out, less than 1,000 persons 18 miles out, and less than 500 at a distance of 20 miles from the core.

In the 1980s, population density jumped at the urban fringe where construction of new residences was concentrated, especially in the southeast and across the north and northwest (see Map 1). Gains were less both inside and outside the ring. Between 1990 and 1995, the location of the ring of new development was not as obvious (see Map 2), probably because of the reduced new construction in the early years of this period in response to an economic slump then a slow recovery. The largest increases between 1990 and 1995 occurred in east central Phoenix and at the southern edge. Average household size fell in areas with a population aging in place, such as Sun City and parts of south central Tempe extending into Mesa's Dobson Ranch. Combined with no new housing construction, population densities declined a little in these areas.

Population densities in 1995, calculated at the census tract level (generally one square mile), are shown in Map 3. Given distance from downtown Phoenix, densities in 1995 were highest in Phoenix west of 35th Avenue, in part because of high average household size. The lowest densities given distance from the center were southeast of the airport and in the favored residential quarter in the northeast.

The more densely settled portions of the Phoenix urbanized area have a relatively high proportion of multifamily housing, but overall, variations in average household size are not significantly correlated to population density. Population density also is not significantly correlated to any other housing or demographic variables from the decennial censuses. It is, however, highly correlated to distance from downtown Phoenix.

FIGURE 1
POPULATION DENSITY IN METROPOLITAN PHOENIX
By Distance from the Urban Center, 1970 through 1995

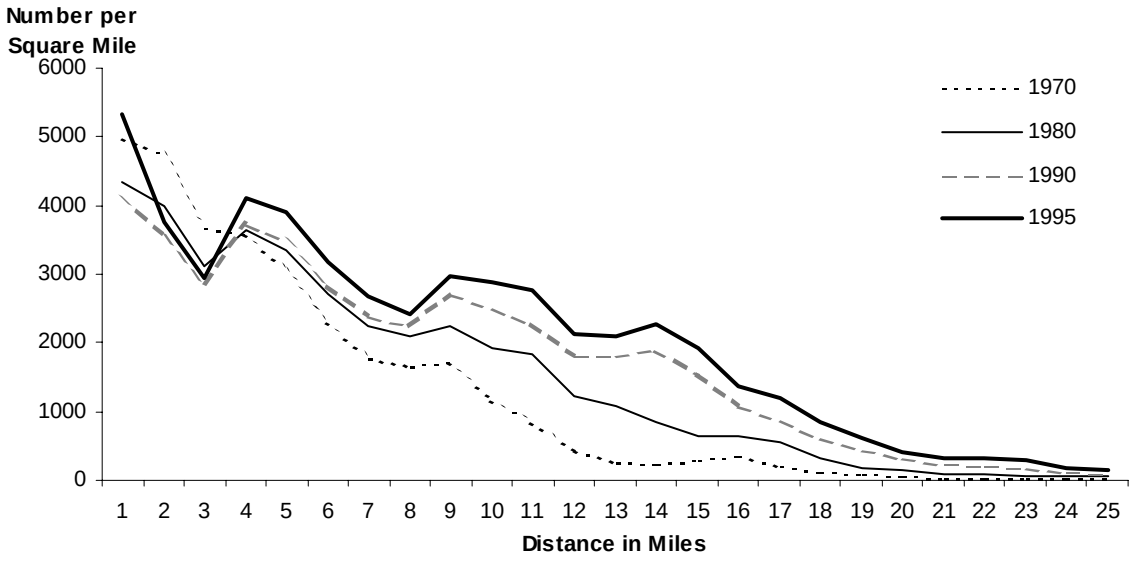
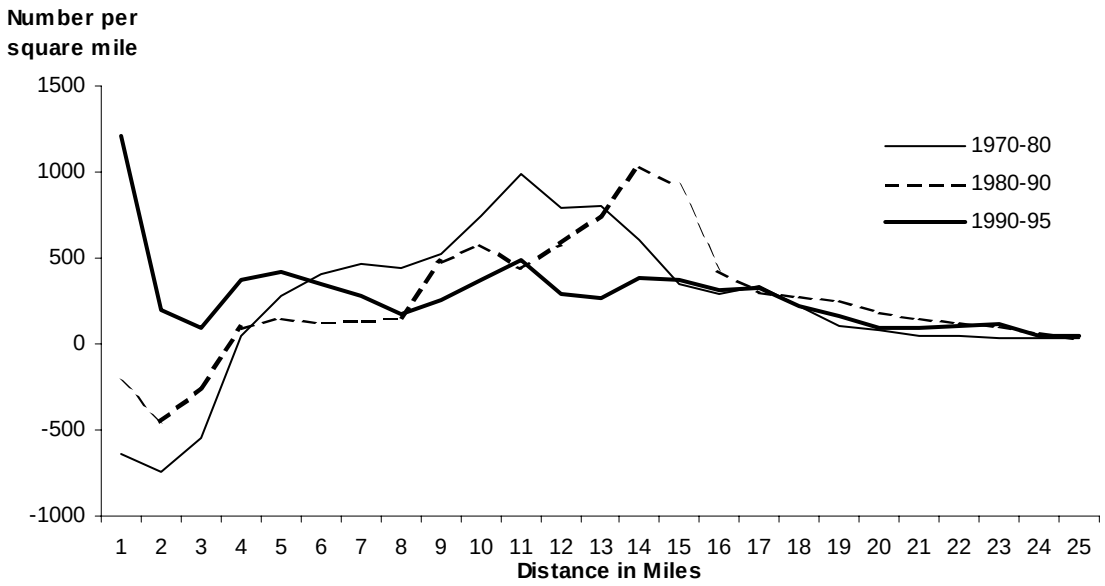
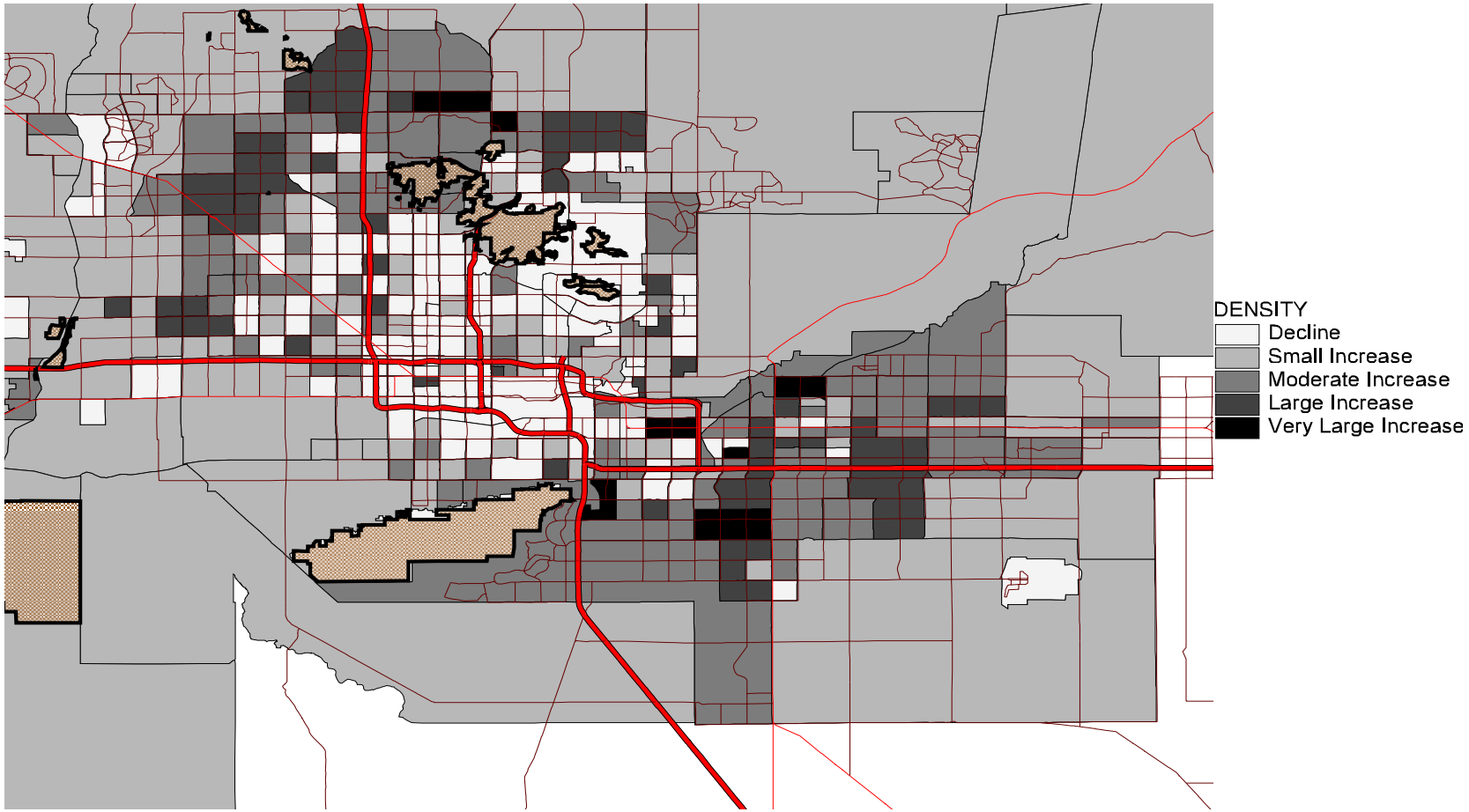


FIGURE 2
CHANGE IN POPULATION DENSITY IN METROPOLITAN PHOENIX
By Distance from the Urban Center, 1970 to 1995



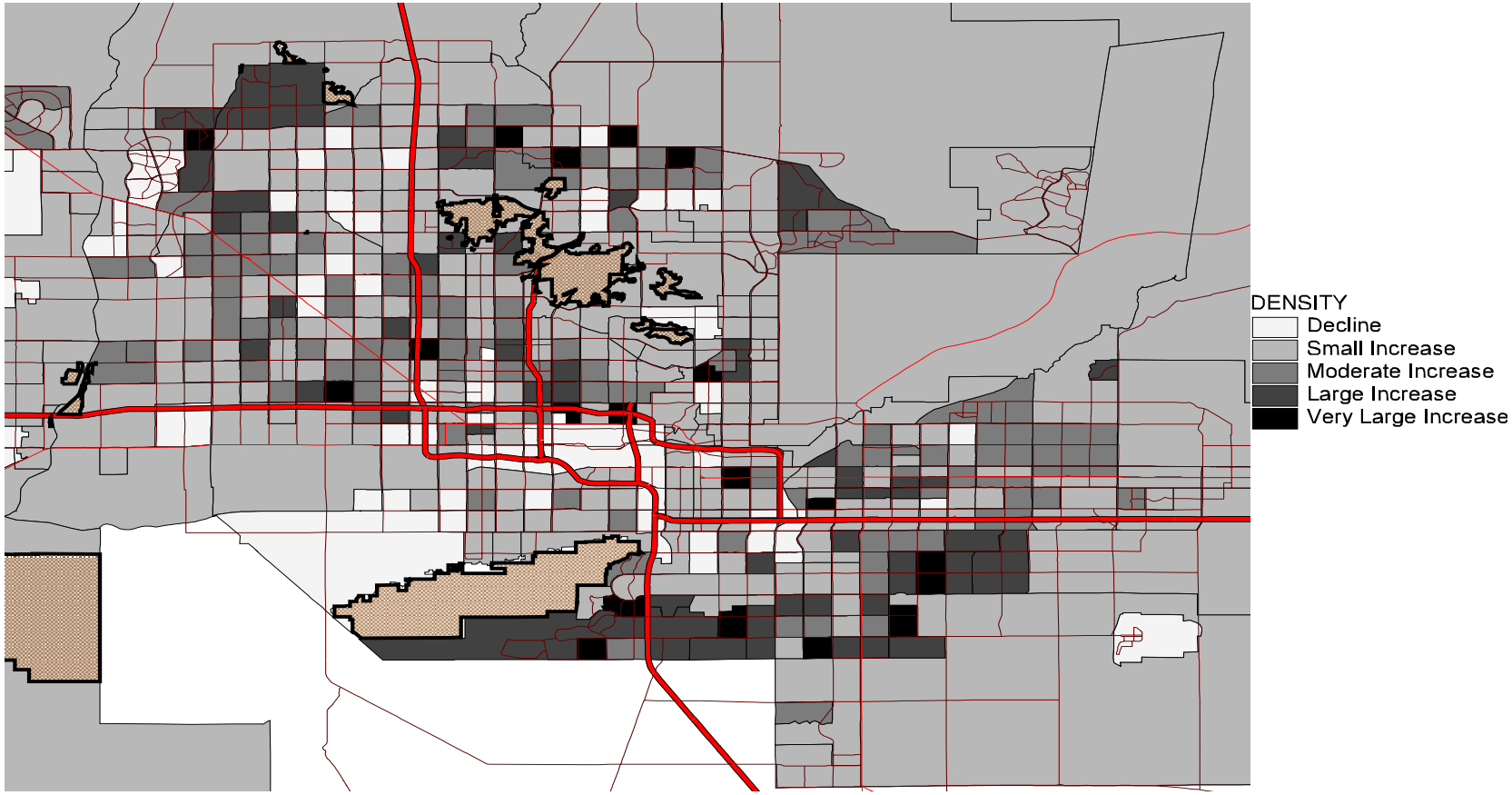
Source (Figures 1 and 2): Calculated from the U.S. Bureau of the Census, 1970 to 1990 decennial censuses and 1995 Special Census.

MAP 1
CHANGE IN POPULATION DENSITY IN METROPOLITAN PHOENIX
Persons per Square Mile By Census Tract, 1980-90



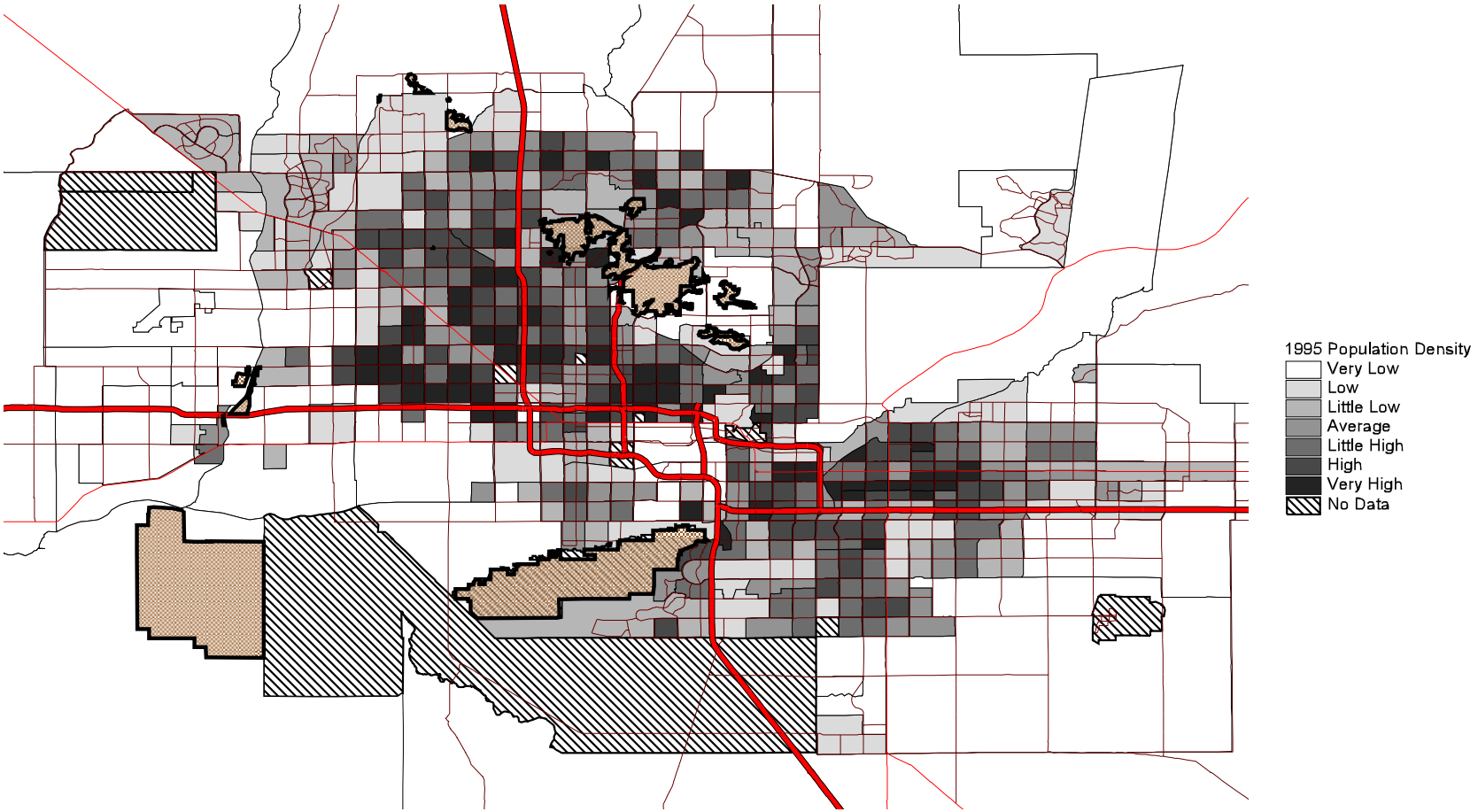
Source: Calculated from the U.S. Bureau of the Census, 1980 and 1990 censuses.

MAP 2
CHANGE IN POPULATION DENSITY IN METROPOLITAN PHOENIX
Persons per Square Mile By Census Tract, 1990-95



Source: Calculated from the U.S. Bureau of the Census, 1990 Census and 1995 Special Census.

MAP 3
POPULATION DENSITY IN METROPOLITAN PHOENIX
Persons per Square Mile By Census Tract, 1995



Source: Calculated from the U.S. Bureau of the Census, 1995 Special Census.

FACTORS CONTRIBUTING TO THE CHANGE IN POPULATION DENSITY

At the simplest level, population density is a function of occupied housing density (occupied housing units per square mile) and average household size**.** In the 1960s, occupied housing density rose modestly, but was offset by a decrease in average household size. In the 1970s, the occupied housing density increased more rapidly, but was negated by a significant decrease in average household size. In the 1980s, average household size dropped modestly, but occupied housing density soared, resulting in the jump in population density.

Because of fluctuations in vacancy rates, changes in housing density vary somewhat from changes in occupied housing density. Vacancy rates fluctuate with the economic cycle, but also are affected by other conditions. Vacancy rates in 1970 were lower than in 1960, but the rate advanced between 1970 and 1980, with a greater increase between 1980 and 1990.

The gain in occupied housing density in the 1980s resulted from a combination of factors. Occupied single-family housing density did not rise much faster in the 1980s than the 1970s, but the number of occupied multifamily units per square mile surged in the 1980s. Zoning allows many more multifamily units per acre than single-family houses. An unusually high proportion of the housing units constructed during the 1980s were multifamily, a result of favorable tax treatment for the construction of multifamily units and high mortgage interest rates limiting the ability to purchase single-family houses, especially among the younger half of the baby-boom generation.

The average lot size of single-family houses was nearly steady during the 1960s and 1970s, but decreased in the 1980s, as detailed below. This contributed to the somewhat greater increase in occupied single-family density in the 1980s.

The amount of land dedicated to non-residential uses and the amount of vacant land each affect housing density by census tract. Non-residential zoning has not been examined, but seems unlikely to be a major factor in changes in urbanized area housing density. While extensive areas of vacant land are excluded from the urbanized area boundaries, many smaller tracts of undeveloped land are included. For example, a quarter-section of undeveloped land surrounded by developed land is included in the land area of the urbanized area. The square mileage of the urbanized area rose much less in the 1980s than in the 1970s even though the numeric population increase in the 1980s was slightly greater than in the 1970s.

While much of the housing development in the 1980s was located near the fringe of the urbanized area, many multifamily units built on infill parcels and considerable single-family housing construction occurred on parcels of land that initially had been skipped over. Declining single-family lot size and the small increase during the 1980s in the urbanized land area suggest that population density at the fringe rose.

The change in urbanized area population density in the 1990s will not be known until results from the 2000 census are released in 2001. However, data on some of the factors affecting population density are available. Single-family houses made up a high percentage of the housing units constructed during the 1990s, contributing to decreased density. However, vacancy rates dropped during the 1990s and single-family lot sizes were substantially smaller than in the 1980s, contributing to increased housing density. In addition, after falling during the previous decades, average household size probably hardly changed during the 1990s, removing a prime cause of decreasing population density. From these factors, it appears that population density in the Phoenix urbanized area climbed further in the 1990s, though not as much as during the 1980s.

POPULATION DENSITY IN PHOENIX VERSUS OTHER URBANIZED AREAS

In 1990, the population density of the Phoenix urbanized area (2,707 people per square mile) was 10 percent less than the median of the nation's 33 urbanized areas with more than one million residents. It also was 10 percent less than the median of the 13 areas in the West with a population of at least one million and was 19 percent less than the median of the 14 areas with a population of more than two million (Phoenix barely was among this group with a population of 2,006,239). Less populous urbanized areas (UAs) tend to be less dense, such that Phoenix's density was the median of 25 UAs in the Southwest with a population of at least 250,000. The density in the Phoenix UA was 4 percent higher than the national total of all urbanized areas.

The density of the Phoenix UA was slightly higher than that of San Diego and Riverside-San Bernardino, the two most proximate UAs of somewhat similar population. Phoenix's density was more than 15 percent higher than in the smaller nearby UAs of Tucson and Albuquerque. However, densities were at least 10 percent lower in Phoenix than in the smaller Las Vegas and Salt Lake City UAs and in the somewhat less populous Denver UA. The Los Angeles UA (which includes nearly all of Orange County) had the highest density in the nation at 5,801. Densities also were higher than in Phoenix in all of the other large UAs in the Pacific Coast states. (Portland's density was 3,021).

Thus, while the 1990 population density in the Phoenix UA was less than in most large western UAs, it was fairly typical of UAs nationally. In contrast, the Phoenix UA's change in density over time was not typical. In the 1960s and 1970s, density was stable in Phoenix while the total of all urbanized areas in the nation dropped 12 percent in the 1960s and 21 percent in the 1970s. In the 1980s, the density in Phoenix jumped 23 percent, compared to a 3 percent decline nationally. The same sort of relative performance is seen in the more specific comparison groups. Phoenix was among the top 10 in each decade in the change in density among the 33 urbanized areas of more than one million population in 1990 and among the 25 southwestern areas with a population of at least 250,000. In 1960, Phoenix's density had been second lowest in both groups.

For the entire 1960 to 1990 period, the numeric increase in density in the Phoenix UA ranked fifth among the 33 UAs of at least one million population, fifth among the 25 southwestern UAs of at least 250,000 people, and third among the 13 western UAs of at least one million, (behind Los Angeles and San Jose). Phoenix's increase was comparable to that in Las Vegas and Salt Lake City and greater than in Riverside-San Bernardino. Densities decreased in Albuquerque, Denver, San Diego and Tucson. The density in Phoenix was less than that in Tucson until the 1980s. (In Portland, densities fell slightly in the 1960s and 1970s, before the passage of the growth management measure, and rose only marginally in the 1980s.)

POPULATION DENSITY IN CENTRAL PHOENIX

Unlike the rest of the Phoenix metropolitan area, the population density within three miles of downtown Phoenix tumbled during the 1970s and 1980s. (Given the fixed geographic area, changes in density equate to changes in population.) Several factors contributed to the core performing differently from the rest of the metro area.

The number of housing units is stable or increasing in most of the metro area. In central Phoenix, however, the number has been falling steadily: down 8 percent in the 1970s, 11 percent in the 1980s, and 4 percent in the first five years of the 1990s (see Table 1). This is the primary reason for the dropping population in the 1970s and 1980s, but the advance in population in the 1990s occurred despite continued removal of housing units. Hardly any new housing has been built in central Phoenix to offset the demolitions.

The special places population provides part of the explanation for the overall population growth in central Phoenix from 1990 to 1995. Close to half of the 1990 to 1995 population gain occurred in special places. The number has been gaining at an increasing rate since 1970. Most of the special places population in central Phoenix lives in prisons located downtown and in the county's Durango complex. Much of the rest were counted in homeless shelters or on the streets. More than 10 percent of the residents of central Phoenix lived in special places in 1995.

Vacancy rates help explain the turnaround in the central Phoenix population in the 1990s. As in the rest of the metro area, vacancy rates as defined by the Census Bureau dropped substantially in the 1990 to 1995 period after rising during the 1970s and 1980s. Much of the decline in vacancy rates after 1990 can be attributed to economic conditions. The 1980 and 1995 vacancy rates were a little lower in central Phoenix than the metro total, but were higher than the average in 1990. However, considerable evidence exists that the 1990 census undercounted the population, in part by marking occupied housing units as vacant, particularly in low-income areas of Phoenix. An inaccurately high 1990 vacancy rate in central Phoenix would cause the swing from a declining population in the 1980s to an increasing one in the 1990s to be exaggerated.

Another factor on which central Phoenix differs from most of the metro area is household size. In 1970, the average household size near downtown was considerably below the metro total. From 1970 to 1980, the metro average dropped considerably, but in central Phoenix the decrease was not nearly as great. In the 1980s, the average household size rose in central Phoenix, but the metro average dropped. The number of persons per household in 1990 was higher in central Phoenix than the county total. The swing in household size from lower than the metro average to above average is related to the rising proportion of the Hispanic population in central Phoenix. Household size had little impact on relative density from 1990 to 1995, as small increases near downtown were similar to the metro average.

TABLE 1
POPULATION AND HOUSING CHARACTERISTICS IN CENTRAL PHOENIX
1970 to 1995

	1970	1980	1990	1995
Population	130,591	111,911	103,544	113,223
In Group Quarters	3,671	4,070	7,013	11,481
In Housing Units	126,920	107,841	96,531	101,742
Housing Units	50,699	46,565	41,402	39,565
Occupied	47,071	42,005	34,736	35,602
Vacancy Rate	7.2	9.8	16.1	10.0
Persons per Household	2.70	2.57	2.78	2.86
Metropolitan Area:				
Vacancy Rate	5.0	10.8	15.2	10.4
Persons per Household	3.14	2.73	2.59	2.62

Source: Calculated from the U.S. Bureau of the Census, decennial censuses and 1995 Special Census.

LOT SIZE

The median lot size of new single-family residences in Metropolitan Phoenix fluctuated between 7,000 and 7,800 square feet (a little less to a little more than one-sixth acre) during most of the 20th century, as seen in Table 2. Lot sizes dropped sharply in 1986 and continued to decline through 1995, with the median falling as low as 6,300 square feet (one-seventh acre). Between the peak in 1981 and the trough in 1995, the median lot size went down 20 percent.

The median lot size has increased since 1995, especially in 1999 when it again reached 7,000 square feet. The advance from 1995 to 2000 was 15 percent.

The median lot size in most Valley cities has been within 10 percent of the county median. The primary exceptions are Carefree and Paradise Valley, with median lot sizes of more than one acre. Lot sizes also have been more than 10 percent above the county median in Sun City West, Fountain Hills and Queen Creek (see Table 3). Avondale has had the smallest median lot size.

In nearly every city, the median lot size between 1986 and 1998 was substantially lower than in the years before 1986. The rebound in lot sizes in 1999-2000, however, has not been consistent by city. In Mesa, Peoria and Avondale the median lot size continued to fall in 1999-2000. Mesa and Peoria went from lot sizes 6 percent above the norm from 1986 through 1998 to 5 percent below the metro median in 1999-2000. In contrast, lot sizes in Chandler and Gilbert jumped from the norm to 15 percent larger in 1999-2000. In addition, the median lot size in Scottsdale has climbed from only slightly above the standard before 1986 to 15 percent higher in 1999-2000.

Within the larger cities, the median lot size generally does not vary too widely by zip code. In Mesa, however, lot sizes in the southeast have been below the metro median, while those in north central zip codes have been well above the median. In Phoenix, the smallest lot sizes have been in the extreme north-northeast, while the largest lot sizes have been in areas near the town of Paradise Valley. Each quadrant of the Valley has areas with larger and smaller than typical lot sizes.

The median lot size of townhouses has been considerably less than single-family lot sizes. Through the early 1980s, the median generally rose but remained less than 3,000 square feet. Since then, the median has been just more than 3,000 square feet (one-fourteenth of an acre).

The median lot size of townhouses varies widely by city, in part because of the age of the housing stock. In some cities, most townhouses were built prior to 1985, when the typical lot size was smaller. The sample size in most cities is quite small – so that the median may not be representative. Fountain Hills, Paradise Valley and Surprise have median lot sizes in excess of 4,500 square feet, while Gilbert, Glendale, Phoenix and Sun City have figures less than 2,500 square feet.

Mobile home lot sizes vary tremendously. The median of a small sample was 6,000 square feet.

TABLE 2
MEDIAN LOT SIZE IN METROPOLITAN PHOENIX, 1900 TO 2000

Year Built	Lot Size in Square Feet
Prior to 1945	7,000
1945-49	7,568
1950-54	7,247
1955-59	7,166
1960-64	7,125
1965-69	7,584
1970-74	7,435
1975-79	7,775
1980-84	7,706
1985-89	7,018
1990-94	6,599
1995-98	6,534
1980	7,828
1981	7,881
1982	7,706
1983	7,686
1984	7,546
1985	7,662
1986	7,026
1987	6,811
1988	6,734
1989	6,574
1990	6,830
1991	6,686
1992	6,817
1993	6,584
1994	6,366
1995	6,277
1996	6,473
1997	6,712
1998	6,677
1999	7,020
2000	7,200

Source: Calculated from data provided by Marketron.

TABLE 3
MEDIAN LOT SIZE BY PLACE, 1900 TO 2000
(In Square Feet)

		Year Built		
	Total	Before 1986	1986-98	1999-2000
Carefree	50,238	Na	na	na
Paradise Valley	43,945	Na	na	na
Fountain Hills	9,565	10,006	8,072	9,193
Sun City West	9,000	9,000	8,900	na
Queen Creek	8,013	na	na	na
Sun City	7,740	8,873	na	7,040
Tempe	7,627	7,667	7,179	9,618
Goodyear	7,605	8,033	6,820	7,680
Scottsdale	7,480	7,658	7,178	8,102
Litchfield Park	7,470	na	na	na
Mesa	7,322	7,562	6,996	6,717
Buckeye	7,290	na	na	na
Glendale	7,266	7,756	6,660	6,820
El Mirage	7,265	na	na	na
Surprise	7,245	na	6,300	7,320
COUNTY				
TOTAL	**7,166**	**7,462**	**6,604**	**7,062**
Chandler	7,157	7,444	6,334	8,153
Gilbert	7,102	7,279	6,578	8,028
Peoria	7,021	8,205	6,990	6,684
Phoenix	7,000	7,231	6,105	6,600
Tolleson	6,863	na	na	na
Youngtown	6,050	na	na	na
Avondale	6,040	6,650	6,749	5,478

na: not available due to small sample size

Note: Places are defined by zip codes.

Source: Calculated from data provided by Marketron, a company based in Phoenix which matches lot size and other data from the county assessor's office to data on recorded real estate sales. Sales recorded from September 1999 through May 2000 were used for this analysis. Since sales of pre-existing houses represent only a small proportion of the non-new housing stock, use of this dataset involves the possibility of sampling error. However, no reason is obvious why the lot sizes by year built of homes that sold in late 1999 and early 2000 should not be representative of the lot sizes by year built of all houses.